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AUTHOR Insua, Ana Maria; Rimoldi, Horacio J. A.
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ABSTRACT

College students were presented with a series of four problems, each presented in four different formats: verbally, in abstract symbols, in negative abstract symbols, and in geometric figures. Problem-solving performance was evaluated in terms of the sequence of questions that a subject asks in order to solve a problem. They were also tested by the Holtzman Inkblot Technique, the California Psychological Inventory, and the Rokeach Dogmatism Scale. The data for the 161 students were analyzed into nine factors by the principal axis method and graphically rotated to an oblique structure. Subjects were classified in three groups (high, medium, and low) on each factor; and the groups were compared for their success in problem solving. Three personality factors appeared to be related to problem solving: a factor related to body image; an ability to define good forms; and a well balanced emotional life exhibiting control of hostility and of anxiety. The language used to present the problems was also discussed. (Author/CTM)

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PERSONALITY CORRELATES OF COGNITIVE PROBLEM SOLVING

Ana María Insua, Ph. D.
Horacio J. A. Rimoldi, M.D., Ph.D.

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PERSONALITY CORRELATES OF COGNITIVE PROBLEM SOLVING

Ana María Insua, Ph. D.
Horacio J. A. Rimoldi, M.D., Ph.D.

Resumen: El propósito de este estudio es observar la relación que existe entre algunas variables de personalidad y el proceso de solución de problemas.

El método utilizado para evaluar la habilidad para solucionar problemas fue desarrollado por Rimoldi y colaboradores. En cada problema se diferenció la estructura lógica y la forma de presentación (lenguaje).

Las variables de personalidad se seleccionaron por medio de un análisis factorial de instrumentos proyectivos y objetivos. Estos eran: la Técnica de Manchas de Tinta de Holtzman, el Inventario California de Personalidad y la Escala de Dogmatismo de Rokeach.

Se observó que tres factores mostraban un efecto en el proceso de solucionar problemas: un factor bipolar complejo con una fuerte connotación emocional, un factor que implica capacidad para definir buenas formas y otro factor relacionado con la imagen corporal. Es decir que las variables de personalidad que se relacionan con un "buen solucionador de problemas" comprenden una capacidad para tomar distancia frente a determinada presentación del mismo, formulándolo en términos generales y requieren una vida emocional bien equilibrada. Finalmente, parece existir una asociación entre la imagen corporal y los factores intelectuales.

Abstract: The purpose of this study is to observe the relationship between some personality variables and problem solving processes.

The methods used to evaluate problem solving ability were developed by Rimoldi et al. In each problem, the logical structure and the manner of presentation (language) have been differentiated.

Three factors showed an effect in problem solving. These are: a complex bipolar factor with strong emotional connotation, a factor that implies a capacity to define good forms and another factor related to body image. That is, the personality variables related to a "good problem solver" include an ability to detach himself from the given presentation of a problem, formulating it in general terms. It is also required a well balanced emotional life. Finally, it seems to exist an association between the body image and the intellectual factors.

PERSONALITY CORRELATES OF COGNITIVE PROBLEM SOLVING (*)

Ana María Insua, Ph.D.
Horacio J.A. Rimoldi, M.D., Ph.D.

1. INTRODUCTION

The purpose of this study is to observe the relationship between some personality variables and problem solving processes. We will not deal here with the various connotations that the word personality has. Some theorists have defined it extremely broadly embracing almost everything that a person does, including physiological functioning and cognitive activity. Others refer to personality in a very narrow sense, eliminating from the definition cognitive and aptitude traits.

Disregarding theoretical considerations it was deemed advisable to incorporate personality evaluations that were expected to explore different levels of personality dynamics.

The method used for the evaluation of the cognitive activity relies heavily on the process that a subject follows, when he is solving a problem. It evaluates the process with reference to an ideal tactic and therefore it is independent of normative samples.

2. METHOD

The Holtzman Inkblot Technique (HIT), The California Psychological Inventory (CPI) and the Rokeach Dogmatism Scale (RDS) were chosen as the suitable instruments for personality evaluation. The HIT was selected under the assumption that it is a projective instrument that provides information about a behavior that is not readily observable. The meaning of the answers are usually ignored by the subject and it is the psychologist's function to interpret it in terms of the hypothesis that he holds. The 18 scales of the CPI and the Rokeach Dogmatism Scale were incorporated to our battery under the assumption that they provide information concerning behaviors of which subjects are fully aware since they refer to situations expressed in ordinary usual language.

The method used to evaluate problem-solving ability was developed by Rimoldi et al. (1,2,3). Problem solving performance is here evaluated in terms of the sequence of questions that a subject asks in order to solve a problem. This defines a subject's tactic. Two major components of the problems are controlled by this method: These are: 1) the logical structure (number and type of logical relationships) and 2) the manner of presentation (Language in which the logical structure and the pertinent information is expressed). Four different logical structures identified as 31, 33, 35 and 60 were administered in an increased order

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of difficulty. Each structure is presented in four different languages identified by letters. Language A is the usual everyday language, language B consists of abstract symbols, language C of negative abstract symbols. The presentation in K language was made using geometric figures of different shapes, sizes and colours.

Subjects: One hundred and sixty-one college students of both sexes, between 18 and 22 years of age, from a large Midwestern university were administered the HIT, the CPI-RDS and the problems. The tests were administered to groups of approximately 55 students.

Procedure: Since the HIT, the CPI and the Rokeach Scale include a total of 40 variables and many of them were intercorrelated it was decided to reduce them to a few factorially defined clusters. For this purpose, a principal axis approach was used; the resultant factors were rotated orthogonally by the Varimax method. Finally, an oblique solution was obtained by graphic rotation.

The variables with the highest saturation among those comprising the particular oblique factor solution were selected to study how individual differences in personality affect problem solving performance.

Three groups, high, medium and low were defined in terms of the subjects' scores in each one of the personality variables. A profile analysis (4) was used to observe how those groups performed in each set of isomorphic problems.

3. RESULTS AND DISCUSSION

Factor analysis of the HIT, CPI and RDS

We are not going to describe the factor analysis of the 40 variables here. The result of it was already published (5). For our purpose it is enough to say that the analysis gave a total of nine factors and that only one factor shows saturation of the HIT and CPI variables. That is, those two sets of instruments, projective and verbal, assess different personality dimensions. It was already said that the variable with the highest saturation in each one of the factors was selected to represent that factor. In this way, the study of personality correlates of problem solving was reduced to nine personality variables.

Experimental relationship between personality variables and problem solving performance.

The crux of the analysis consisted in examining how problem solving performances are related to scores in the nine personality variables. Five of these give no unusual results and four shows influence on problem solving performances. The variables that have an effect on problem solving are: Controlled Emotion (integrated with two scales from the HIT and one scale from the CPI), Body Image (integrated with the scales Barrier and Penetration from the HIT),

Form Appropriateness (represented by the homonymous variable of the HIT) and Norms Acceptance (represented by the variable Communality from the CPI).

Consequently, a clear dichotomy in the two types of instruments, projective and objective, used for personality evaluation is observed. Some of the variables defined by the Holtzman test seem to have an effect on problem solving performance but the CPI Scales have limit or no effect. It seems that a verbally self substantiated opinion about personality - as in the case of the CPI- with all its social connotations is not related in any appreciable way to intellectual processes, while dynamic personality evaluations based on the structuring of ambiguous stimuli - and thus assumed to correspond to deeper personality clusters - do affect intellectual processes.

Of those variables that produce an effect on problem solving, one of them, Controlled Emotion represents a kind of gentleness and affection associated with control of agressive impulses and of anxiety. Figure 1 shows the problem solving performance of the groups high, medium and low on Controlled Emotion. Notice that each graph includes all the pertinent statistical information. In the left hand column are written the total number of subjects (N) and the subjects in each group (n). Since the method of profile analysis establishes the parallelism of the curves, a P indicates if the parallelism hypothesis is to be retained and a N.P. indicates the rejection of the hypothesis. GR refers to the differences between the high, medium and low groups. GR is followed by the level of significance obtained or by N.S. when the difference is not significant. The comparison between the high, medium and low groups is indicated by H, M or L. The underlined symbol designates the group with the higher value. The same procedure is followed with regard to language differences, indicated by LANG. The letters A, B, C and K designate the everyday language, the symbolic, the negative symbolic and the geometrical objects modes of presentation of the problems.

Looking at Figure 1 it is observed that the curves corresponding to structure 31, 33 and 60 are parallel but the one corresponding to structure 35 are not. Therefore, a simple one way Analysis of Variance was performed for each language, to determine differences between groups and for each group to determine differences among languages. These are identified by the heading ANOVA. In structure 35 the High Controlled Emotion group performs statistically better than the low group when the problem is presented in the A language. The same pattern is presented in structure 60, although here the curves are parallel. The overall differences between groups is significant at the .05 level with the middle group and, to a lesser degree, the high group being different from the low group. Problems of the 60 series have a complex structure and a difference between groups may point to the importance of a well balanced emotional life to solve successfully a complex problem. In others words, negative emotions, like anxiety and hostility, may interfere with thinking processes in the solution of a difficult problem.

Figure 2 presents the results obtained with the HIT variable Form Appropriateness. This variable has been defined as the capacity to structure a good form from ambiguous stimuli. Generally it has been associated with intelligence since its deals with the correspondence between the form suggested in the response to the form of the inkblot. In Figure 2, it can be observed that for structure 31, 33 and 35 the performance curves are parallel and there are no significant differences between groups. Structure 60 is not parallel. The groups are significantly different when the problems are presented in the symbolic languages (B and C) and in the pictorial language (K). It is interesting to observe that the low group performs better than the high and middle groups in the abstract languages (B and C). In the cases of the pictorial language (K) , the result is reversed and the high and middle groups have better problem solving scores than the low group. This trend is also observed in Structure 31 and 35 although the results are not significant. The interpretation may tentatively be clarified considering that subjects high in apprasing details, good common sense and a positive approach to reality, would find it difficult to deal with abstract symbols (languages B and C). This difficulty would dissappear whenever the problems are given in a verbal or pictorial context. It could perhaps be suggested that people bound to definite perceptual forms would find it hard to deal with presentations where form is not a crucial element, like in the case of the abstract languages. Our results suggest that care should be taken in the interpretation of Form Appropriateness as a sign of high mental ability. It is quite possible that an excellent level of Form Appropriateness, reflecting an excessive narrow and critical attitude, may be a handicap in intellectual functioning. On the contrary, the responses of very intelligent individuals, being free and flexible, may not fit exactly the outline of the inkblot.

The graphs corresponding to the variables Body Image and Norms Acceptance will not be presented because their effect in problem solving performance is very weak.

The pattern of significant differences between languages can be dichotomized into those differences that appear in structures 31, 33 and 35 and those in structure 60. In the first three structures, languages A and K are not statistically different and both languages are superior to B and/or C. In other words, the problems presented in ordinary oral language and in pictorial language are solved more efficiently that problems presented in abstract terms. In structure 60, language K is worse than either A, B or C. It is to be noticed that language K consists of coloured geometrical drawings that make it difficult for the subject to process complex structures like structure 60. Therefore, the language used to present and operate with a logical structure is not irrelevant. A concrete pictorial language is appropriate for simple or relatively difficult problems but it is useless for complex problems, like those belonging to structure 60. It is probable then, that thinking is not exclusively a matter of solving logical structures but also a matter of the presentation used.

The results of our study permit to infer some characteristics of the "good" problem solver, besides those of an intellectual type. It seems that he is not rigidly fixed to the immediate presentation of a problem. On the contrary, he is able to detach himself from the given presentation and transform it into more abstract terms. This is perhaps the meaning traditionally attached to the concept of intelligence as a capacity to abstract by using operations of the analytic and/or synthetic type. Notice that in terms of the material used in this study, this ability may be either facilitated or hampered according to the intrinsic logical complexity of the problems and its manner of presentation. A good problem solver seems to require a well balanced emotional life and a capacity to control the disturbing effects of hostility and anxiety.

Finally, there is an association between body image and problem solving although the nature of this relationship is not as yet clear.

Buenos Aires, November 1976

Ana María Insua, Ph. D.
Horacio J.A. Rimoldi, M.D., Ph. D.

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APPENDIX

Figure 1

Controlled Emotion

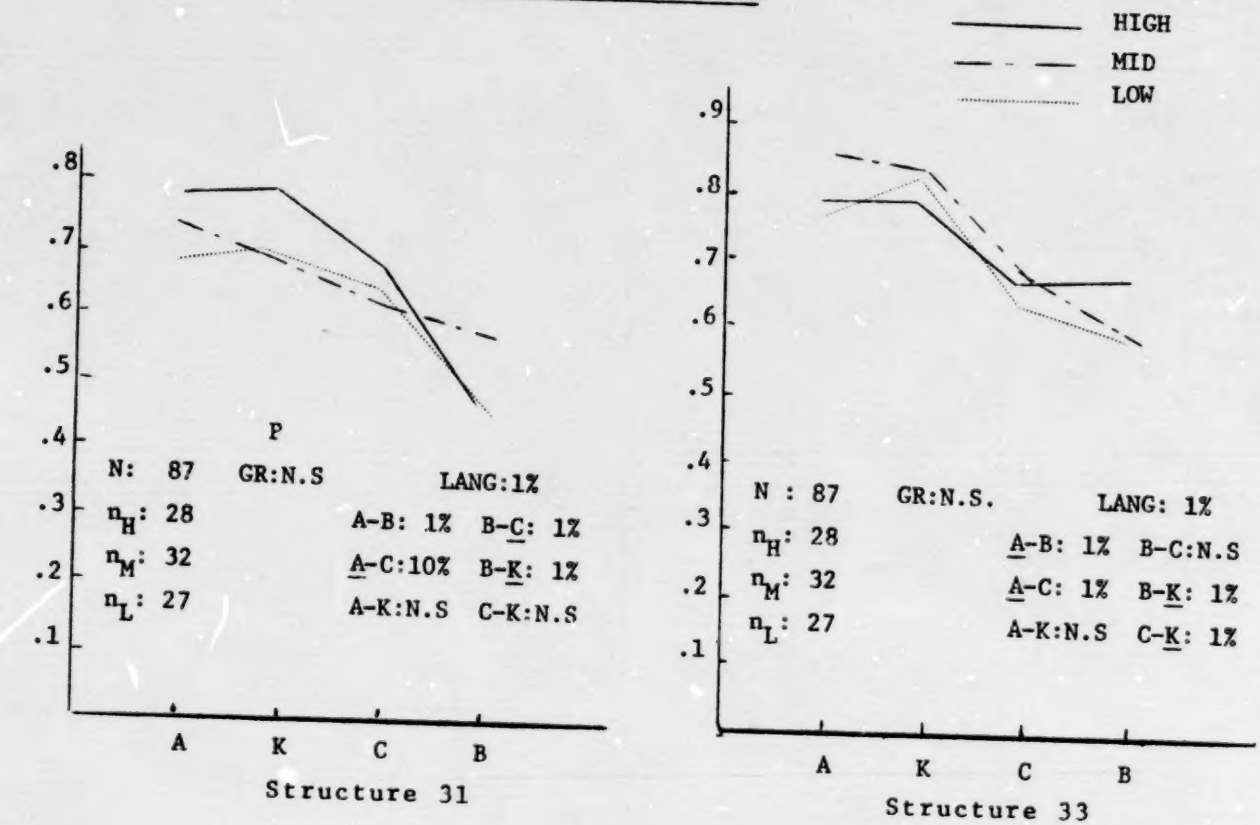
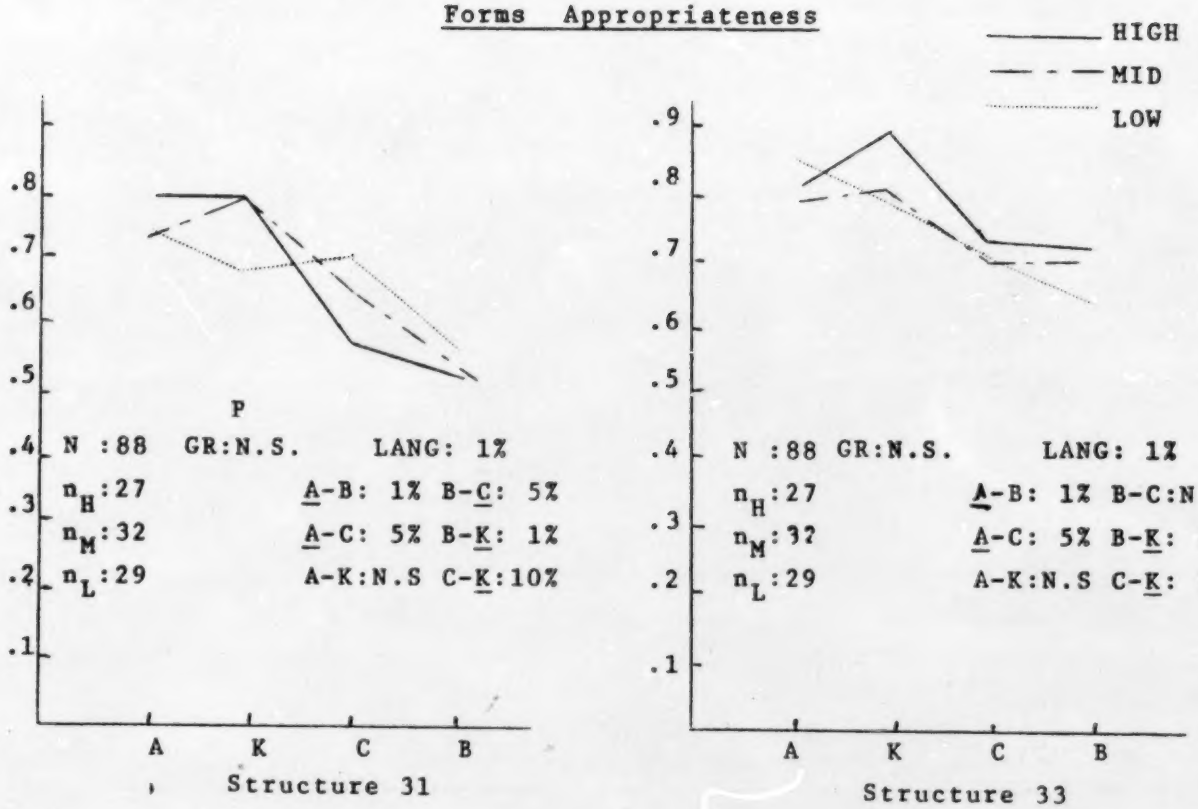


Figure 2

Forms Appropriateness



P

N :88 GR:N.S. LANG: 1%

n_H:27 A-B: 1% B-C: 5%

n_M:32 A-C: 5% B-K: 1%

n_L:29 A-K:N.S C-K:10%

Structure 31

P

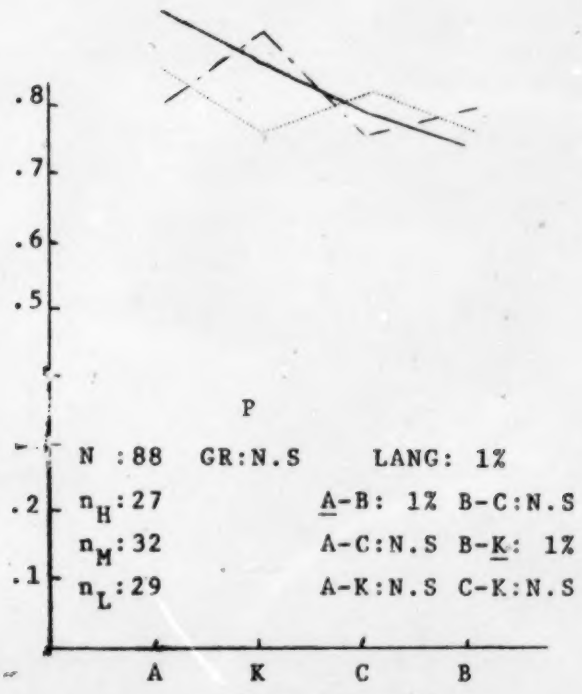
N :88 GR:N.S. LANG: 1%

n_H:27 A-B: 1% B-C:N.S

n_M:32 A-C: 5% B-K: 1%

n_L:29 A-K:N.S C-K: 1%

Structure 33



P

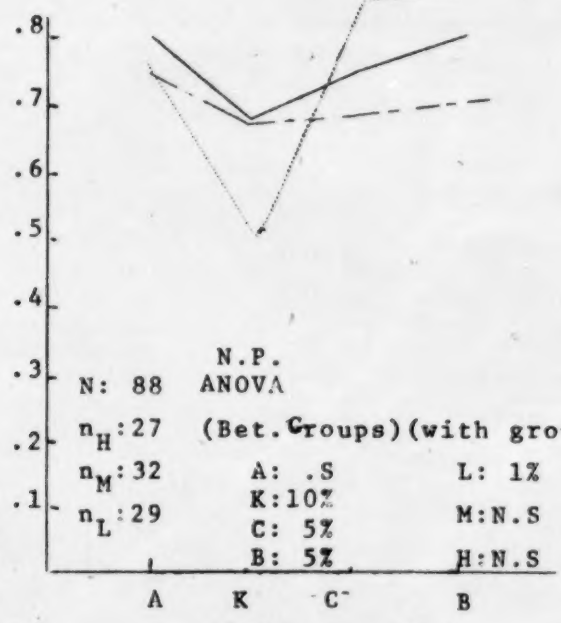
N :88 GR:N.S LANG: 1%

n_H:27 A-B: 1% B-C:N.S

n_M:32 A-C:N.S B-K: 1%

n_L:29 A-K:N.S C-K:N.S

Structure 35



N.P.

N: 88 ANOVA

n_H:27 (Bet. Groups)(with groups)

n_M:32 A: .S L: 1%

n_L:29 K:10% M:N.S

C: 5%

B: 5% H:N.S

Structure 60

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